Chapter 26

Archaeological Case Study

Anasazi Remains from Cottonwood Canyon

In the following three case studies, the fundamentals of osteology outlined in Chapters 1–22 of this book are applied to fossils. Plio-Pleistocene hominid bones and teeth are rare, usually fragmentary, and almost always fossilized. A case study from an entirely different context is presented here. The skeletal remains are from anatomically modern humans found during an archaeological excavation.

In the post-Pleistocene archaeological record, many human skeletons recovered in and around habitation sites consist of single burials. When intact, these burials are relatively easy to analyze. Any one of hundreds of case studies involving such remains could have been chosen for this chapter, but most would have added little information to that provided in previous chapters. In contrast to the assessment of primary burials, bundle burials and ossuaries are progressively more difficult for the osteologist to deal with because the skeletal remains in them are usually more mixed and fragmentary. Even bigger challenges for the osteologist involve analysis of mixed cremations and other cases in which the skeletal remains have been deliberately damaged. In this chapter we present one such challenging case.

Characteristics of skeletal remains from some archaeological sites in the American Southwest have led investigators to conclude that sporadic cannibalism was practiced by the Anasazi, a prehistoric Native American group responsible for, among other things, constructing impressive cliff dwellings such as those at Mesa Verde in Colorado. In this chapter we describe the discovery, recovery, and analysis of one such assemblage from the state of Utah. This case study demonstrates the importance of being able to identify fragmentary osteological remains. Furthermore, it provides an illustration of how the study of osteological remains in an archaeological context can make significant contributions to the understanding of past events and behaviors.

26.1 Cannibalism and Archaeology

Cannibalism is a subject that holds considerable interest for the anthropologist. Workers in all three subdisciplines of anthropology—ethnology, archaeology, and physical anthropology—have become involved with the study of cannibalism over the past century. Textbooks in anthropology typically report on cannibalism in both the recent and the deep past. Students learn about cannibalism at Zhoukoudian, among the Aztec, and in highland New Guinea.

In 1979 William Arens wrote *The Man-Eating Myth,* in which he investigated some of the most popular and best-documented cases of cannibalism in the ethnohistorical record. Arens concluded that, aside from survival conditions, there was inadequate documentation of cannibalism as a custom in any form in any society. This conclusion sparked considerable controversy, but most critics agreed that, if cannibalism were as widespread as anthropologists had traditionally maintained, better documentation would be required to demonstrate it. Ethnologists have, however, run out of time to provide the documentation. Even in the remote corners of the world where cannibalism was widely reported in the 1800s, the practice no longer exists. The documentation, if it is to be forthcoming, will therefore have to come largely from the archaeological record.

Because the early historical and ethnographic accounts of cannibalism are riddled with doubts and because ethnographic observation is no longer possible, archaeology is the only remaining tool for investigating the existence and extent of cannibalism. But how is cannibalism recognized in the archaeological record? A long history of work on faunal remains from archaeological contexts provides the answer. The faunal analyst studies the context of the nonhuman bone assemblages from archaeological sites and the composition and modifications to these assemblages (cut marks, hammerstone percussion marks for marrow removal, and other trauma). The butchery and consumption of animals can be understood from these observations of faunal remains. When human remains from an archaeological site are consistent with a nutritionally motivated breakdown — when patterns of burning, cut marks, percussion marks, crushing, and other fracture on human remains match what is seen on faunal remains — the assemblage is usually interpreted as evidence of cannibalism.

Over the past 20 years there has been an accumulation of evidence in the American Southwest that indicates the occurrence of cannibalism among the Anasazi. Anasazi burials are typically primary burials and are often accompanied by grave goods. However, during excavation of several sites in the Four Corners area of Colorado, Arizona, New Mexico, and Utah, human skeletal remains have been encountered that were obviously not in primary contexts. These remains are extremely fragmentary, with obvious cut marks, intentional fracture, and signs of burning. Turner (1983b) and White (1992) summarized the evidence and concluded that cannibalism was practiced at these localities. Turner and Turner (1999) have extended these studies. The practice was very uncommon, however, as the number of recorded instances of cannibalism is very small when compared to the thousands of Anasazi sites that have yielded evidence of intentional, primary, considerate burial.

26.2 Cottonwood Canyon Site 42SA12209

Site 42SA12209 is an Anasazi Pueblo I habitation site located in Utah's Cottonwood Canyon, near the town of Blanding (Fetterman et al., 1988). The site was damaged by a uranium mining road in the 1950s or 1960s and not recorded until a 1971 archaeological survey covered the area. Because the site was seasonally impacted by road maintenance, the Forest Service arranged for testing in 1986 and salvage excavation by Woods Canyon Archaeological Consultants, Inc., in July of 1987.

The site is located about 2000 m above sea level in the semiarid Upper Sonoran life zone. The site was part of a large Cottonwood Canyon Pueblo I community. More than one hundred sites have already been located in the area. Based on dendrochronological analysis and ceramic seriation, occupation dates to the latter half of the ninth century (880–910 A.D.). The material culture, pollen, and macrobotanical remains from the site all indicate that the prehistoric inhabitants were agriculturalists who relied heavily on the cultivation of corn for their subsistence.

26.3 Discovery

The salvage fieldwork was aimed at excavating the portion of the site in danger of disturbance by road maintenance. This part of the site consisted of a plaza and seven surface rooms. Associated with the fill of one of the structures (Structure 3) was a feature consisting of hundreds of human bone fragments. The main concentration of bones was in an area 70 × 60 cm, vertically concentrated in a section of room fill 20 cm deep (Figures 26.1 and 26.2). The fill in this area was charcoal-stained and ashy, with much refuse. Among the hundreds of bone fragments, only one articulated hand was found (Figure 26.3). The "interment" was therefore not primary, and it obviously consisted of more than one individual. The remains were interred sometime after the abandonment of Structure 3 because the pit was dug into the roof-fall of the structure. To ascertain as much as possible about the biology of the individuals whose skeletal remains had been discovered in Structure 3, Jerry Fetterman of Woods Canyon Archaeological Consultants engaged human osteologists at the University of California at Berkeley.

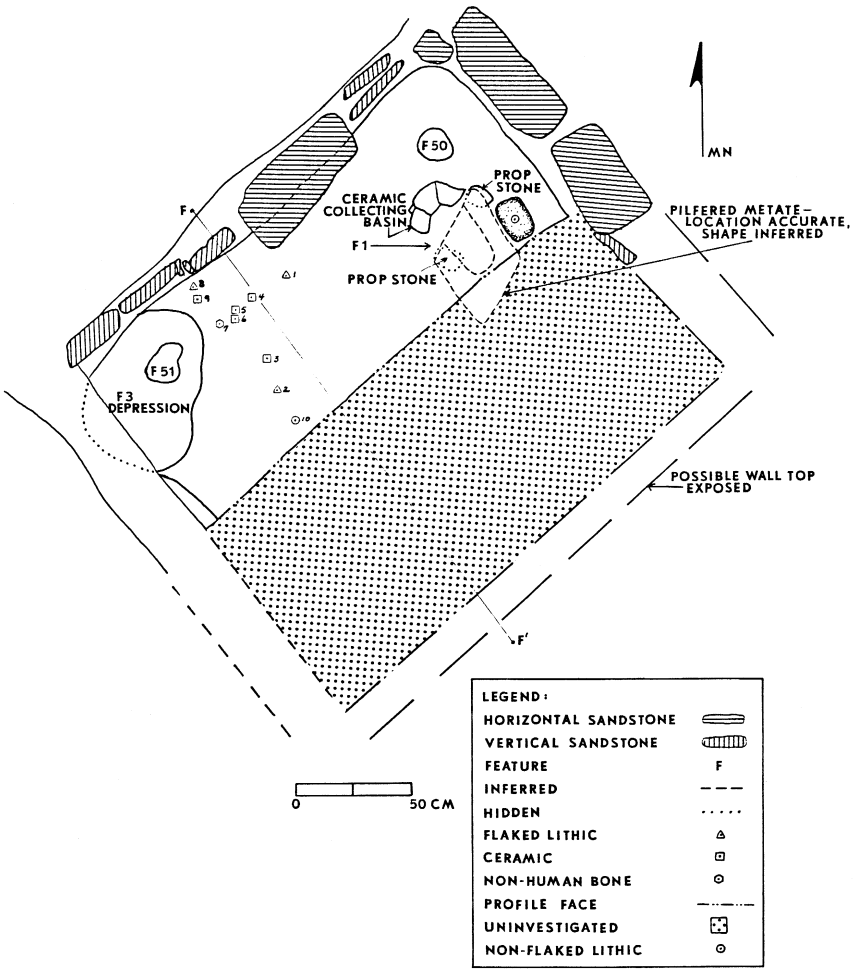

Figure 26.1 **Plan map of Structure 3 showing the Feature 3 (F3) depression from which the human bones were recovered.** This shallow pit extended below the surface in the west corner of the room and was filled with charcoal-stained and ashy material, with a good deal of refuse (from Fetterman et al., 1988).

Figure 26.2 **Inverted human cranium lacking the base, with fragments of human limb bone shaft inside, *in situ* in Feature 3**. Note the nearby plant roots.

26.4 Analysis

26.4.1 Patterns of Damage

Approximately 700 specimens, mostly fragments of bone, arrived in the Berkeley laboratories in autumn 1987. Unlike the remains from several other localities in the Southwest which yielded this kind of material, the Cottonwood assemblage was not particularly well preserved. Root activity had etched the bone surfaces and weakened the fragments, making the collection difficult to handle and analyze. It was immediately apparent, however, that the patterns of damage on the assemblage were similar to those already reported by Nickens (1975) and Turner (1983b) at other sites (*i.e.,* possible cannibalism).

26.4.2 Sorting and Refitting

Procedures involving the identification of specimens in an assemblage like the one from 42SA12209 differ considerably from standard bioarchaeological practice. In normal osteological work, all broken elements are glued together, and all elements are then identified by direct comparison with complete skeletal material. The methodology developed to deal with assemblages like the one from Cottonwood Wash proceeds through several different analytical steps to ensure that the results can be compared directly to results reported by faunal analysts who rarely practice **refitting** (or **conjoining**: the fitting together of broken pieces). Data on the Cottonwood remains were therefore collected for use by both faunal analysts and physical anthropologists (White, 1992).

The Cottonwood Wash specimens received in Berkeley were unwrapped and sorted into cranial and postcranial elements (Figure 26.4). Because of the delicate nature of the bones, care was taken in handling the material. All specimens were identified and sorted by element category, side, and age. Primary identifications were made very conservatively because guessing about element identity at this stage can have negative effects on refitting broken pieces in later phases of the analysis. For example, if a femur fragment is first misidentified as a tibia fragment, it will not be checked against femur fragments later in the analysis, and potential joins will thus be missed.

Figure 26.3 **Articulated human hand and wrist *in situ* in Feature 3**. Note the nearby roots and the limb bone shaft splinters projecting from the excavation wall.

Because of this potential problem, a series of four indeterminate postcranial element categories were used during the element sort.

All recognizably nonhuman elements were separated at this stage of the analysis. None of these were from the feature in Structure 3. The 691 remaining elements were all either recognizably human or indeterminate, with no way to eliminate the possibility that they were human. The number of identifiable human pieces and the lack of identifiable nonhuman pieces in the collection suggested that most of the unidentifiable fragments were human.

Once all of the specimens were sorted into element categories, data on specimen number, siding, fragmentation, element identity, age, identity in standard faunal analysis, and trauma were entered into a computerized database file. Specimens were examined for signs of perimortem trauma by eye and hand lens under strong directional lighting. Cut marks, burning, hammerstone impact scars, adhering flakes (flakes that adhere to the specimen on the edges of impact points), anvil damage, and crushing were all scored as present or absent.

All specimens were systematically checked against each other within each element category to see whether or not they joined. A systematic refitting exercise is time-consuming, but it is necessary for maximum restoration of the bones. Each cranial piece, for example, was checked against every other cranial piece in the collection for which a join was possible. For each pair of bones, all broken edges of the first piece were systematically checked against all broken edges of the second piece.

Of course, a join between two intact right temporals is impossible and need not be checked. Similarly, there is no reason to check a broken temporal edge against a frontal, because these bones do not articulate. Thus many pieces can be ruled out as impossible joins before any checking of broken edges is done. For pieces of vault or limb bone shaft, however, whenever the cortical thickness makes a join a possibility, that possibility must be completely explored. This means checking every appropriate broken edge of a given fragment against every other appropriate broken edge in the collection. This systematic refitting involves physically passing one broken edge against another, looking for a join. When the bone locks into place, the analyst should check for

matches in the cortical thickness as well as in anatomical structures that cross the break. Color and edge length are not factors to consider in such analysis, because post-depositional factors can differentially stain bones in the ground. Furthermore, several fragments can join along the broken edge of a single specimen. Figure 26.5 shows systematic refitting in progress.

The systematic refitting exercise produced many joins across the anciently fractured surfaces of the bone collection from Cottonwood. Nearly 140 pieces were found to join within 33 sets. Some sets were made up of nearly 30 pieces. Joins found during the exercise were temporarily taped together for analysis and photography. Gluing together specimens in an assemblage in which breakage was ancient is not recommended, because it gives future investigators an inaccurate portrait of the assemblage and makes comparison with nonhuman faunal remains more difficult. A few of the fractures were obviously of recent origin because of color and surface texture. These were glued together and notes in the catalog were made to this effect.

Figure 26.4 **Analysis of the Cottonwood osteological sample**. The specimens were identified and sorted by element, and each fragment was examined for possible refitting.

Figure 26.5 **Refitting of the Cottonwood sample in progress**. Within element categories, each specimen is checked against all other specimens for possible joins in an effort to restore skeletal elements.

Figure 26.6 **The minimum number of four individuals in the Cottonwood sample was estimated on the basis of cranial parts**. Specimens are shown here after refitting. White tape holds temporary joins. One-fourth natural size.

26.4.3 Minimum Number, Age, and Sex of the Individuals

The archaeologists wanted to know exactly how many human individuals were represented by the collection of nearly 700 osteological specimens. It was possible, but extremely improbable, that each unrefitted, nonantimeric (not mirror images from opposite sides) fragment was from a different individual. A more appropriate method for estimating how many individuals were involved in the collection was the determination of the minimum number of individuals (MNI, see Chapter 15) that must have been represented to account for the remains recovered. A true minimum number count for a bone assemblage takes into account element, side, age, sex, occlusion, articulation, and antimeric partners.

The original on-site feature report for 42SA12209 noted the presence of at least two individuals and called for further analysis. For this site, as for many ravaged paleontological and archaeological assemblages, the MNI was determined on the basis of the cranial and dental evidence. The MNI of four individuals was calculated independently from both the dental and the cranial evidence (Figure 26.6). There were two immature frontal bones that probably belonged to the two individuals identified on the basis of teeth. There was an intact frontal belonging to a major vault portion of an adult specimen that included mostly intact parietals. A second adult individual was indicated by a large conjoined set from a partial vault with parietal areas duplicating those of the first adult.

These MNI results were achieved after refitting. Identical results were obtained by looking at the dental evidence prior to refitting. Using all of the available evidence, the four individuals based on craniodental evidence were defined as follows:

- **Individual 1.** A fragmentary maxilla with associated teeth. An age of 12 years is indicated by barely open canine and premolar root apices.
- **Individual 2.** Another maxilla fragment with associated teeth. This individual is slightly advanced in root fusion over individual 1, with a probable age of 12.5 years.
- **Individual 3.** Conjoining cranial specimens indicate a robust individual. Probably associated, on the basis of robusticity and size, is another craniofacial conjoining set, a mandibular conjoining set, and isolated teeth. This individual is an old adult.
- **Individual 4.** This individual is represented by most of a cranial vault and probably associated mandible. This individual is also an old adult.

In summary, the assemblage contained a minimum of two immature individuals at about age 12 years, and two old adults. Nothing in the postcranial sample was at odds with this assessment.

Sexing was not possible for the immature individuals. One of the adults was obviously male because of size and robusticity. The smaller adult vault was probably of a female individual. Strong artificially produced flattening of the posterior parietal and occipital areas, a cradle-boarding effect, was evident on both adult crania. The adult male had thickened cranial vault bones, suggesting a response to anemia. The presumed mandible of this individual showed extensive antemortem loss of the posterior teeth and subsequent alveolar resorption.

The presumed adult female individual showed heavy mandibular tooth wear and a large carious lesion on one first molar with an associated abscess in the mandibular alveolar region. A small adult metatarsal head showed minor arthritic lipping.

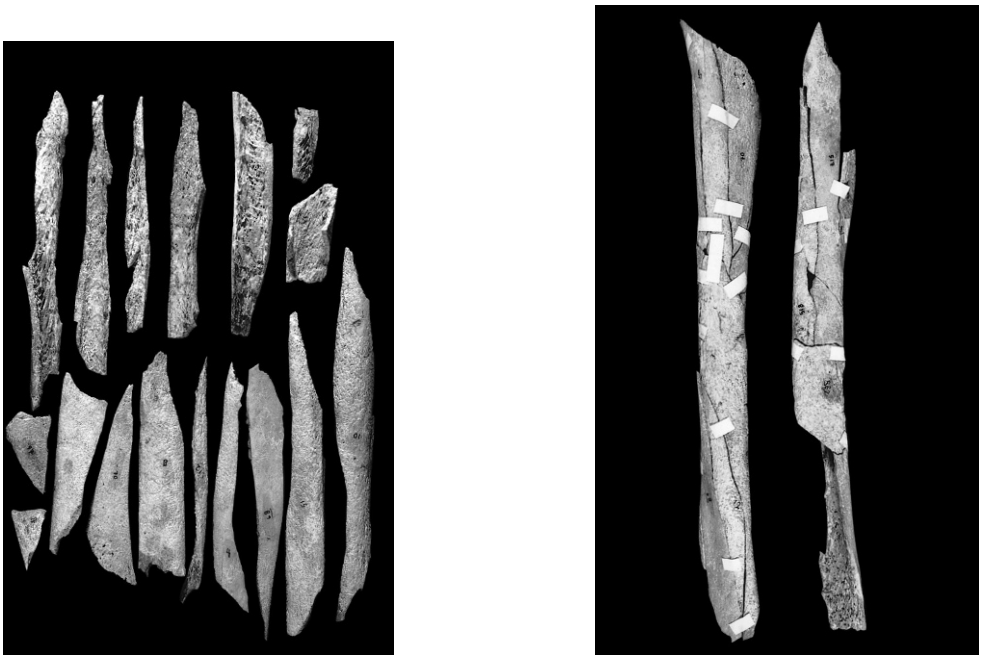

Figure 26.7 **Adult femora from the Cottonwood sample**. *Left:* individual fragments of shaft prior to refitting; *right:* two femoral shafts restored in the refitting exercise. Note that the bone ends are still missing. Masking tape marks and binds the temporary joins. One-fourth natural size.

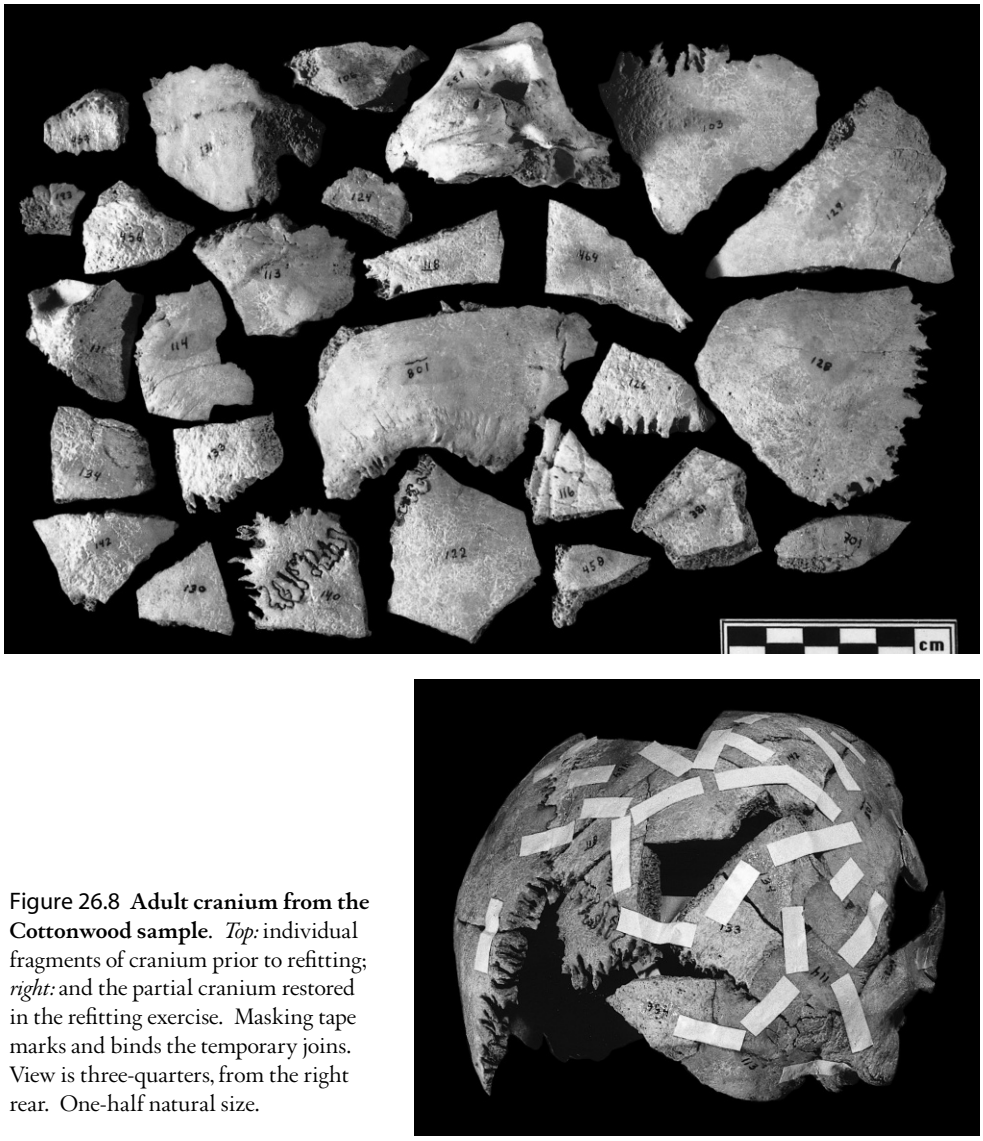

Figure 26.8 **Adult cranium from the Cottonwood sample**. *Top:* individual fragments of cranium prior to refitting; *right:* and the partial cranium restored in the refitting exercise. Masking tape marks and binds the temporary joins. View is three-quarters, from the right rear. One-half natural size.

26.5 What Happened? The Osteological Contribution

The large number of joins within the assemblage, particularly in the cranial vaults and the post-cranial conjoining sets, suggests that the bones were interred in Structure 3 soon after they were fractured (Figures 26.7 and 26.8). There is no doubt that the fractures crossed by the conjoins represent perimortem damage.

Beyond element preservation and representation, evidence for trauma was preserved in the form of surface modification of the bones in the assemblage. The preservation of the Cottonwood Wash assemblage, with much of the surface detail lost to root etching and erosion, made accurate observation of surface trauma to the bones extremely difficult. This poor preservation rendered quantification of cut marks, hammerstone and anvil damage, burning, and other modification meaningless and misleading; most of the evidence of perimortem surface modification had been erased by postmortem depositional modification.

The fracture on the cranial vaults of all four individuals was ancient, as indicated by the percussion scars, adhering flakes, crushing, anvil damage, and internal and external vault release (Figures 26.9 and 26.10). This pattern of fracture has been seen in other assemblages in the Southwest, particularly the one from Mancos Canyon (Nickens, 1975; White, 1992).

Fracture of the postcranial elements followed the pattern seen at Mancos and elsewhere, with shaft splinters dominating the assemblage. Fracture appears to have occurred while the bone was fresh. Indeterminate cranial fragments were the next most frequently encountered items. Estimates showed that fewer than 60 specimens in the assemblage, less than 10% of the sample, would have been considered identifiable by a faunal analyst.

The portions of each skeletal element represented in the refitted assemblage were also revealing. There was an absence of parts composed of spongy bone; for example, proximal humeri and vertebral bodies were absent. This pattern of element representation and element preservation has also been described for other assemblages in the Southwest. The intentional crushing of spongy bone portions may be involved with extraction of nutritive value from bone as described in ethnographic situations; it is suggestive of cannibalism.

Crushing of the bone was most evident on cranial pieces, and stone-on-bone impact seems to have been responsible. A few specimens showed clear scars of hammerstone impacts that did not result in fracture at the impact point. Several specimens showed flakes of bone still attached to the region immediately adjacent to the hammerstone impact point. These flakes were particularly evident on the long-bone shaft fragments and on the cranial vault pieces. There was some evidence of anvil scratching. The cut mark evidence from the collection was particularly poor, these superficial marks being susceptible to erasure by root action and bone exfoliation. There were, however, examples of cut marks preserved (Figure 26.11).

Unlike the better preserved Mancos Canyon collection, the Cottonwood Wash material was difficult to assess with respect to burning because of the preservation problems described above. It was evident that many of the fragments were burned, some of them extremely calcined. Little can be said about the burning of cranial elements prior to fracture of the vault or burning of the postcranial elements. After fracture, however, some of the fragments were intensely burned. This post-fracture burning included both vault and postcranial pieces in which conjoining showed fresh unburned bone on one side of a fracture edge and heavily burned bone on the opposite side, implying that some bone fragments were discarded in a fire after fracture.

The data from conjoining combine with the evidence of trauma detailed above to show that fragmentation of the assemblage resulted from percussion blows directed at cranial vaults and limb bones. Refitting results also show that many parts were missing from the assemblage.

Several important conclusions were drawn from the analysis of the assemblage from Cottonwood Wash. The assemblage from the feature in Structure 3 included no recognizable nonhuman elements. It included artificially fragmented bones and teeth representing the cranial and postcranial remains of at least four individuals. Two of these individuals were old adults, one a male and one probably a female. Two were young individuals of approximately 12 years of age.

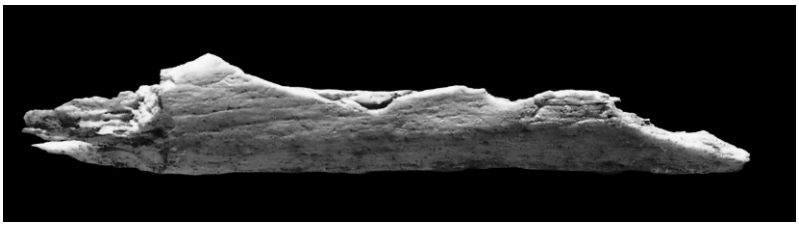

Figure 26.9 **Limb bone shaft fragment from the Cottonwood sample shows evidence of hammerstone percussion**. Magnification 1.5×.

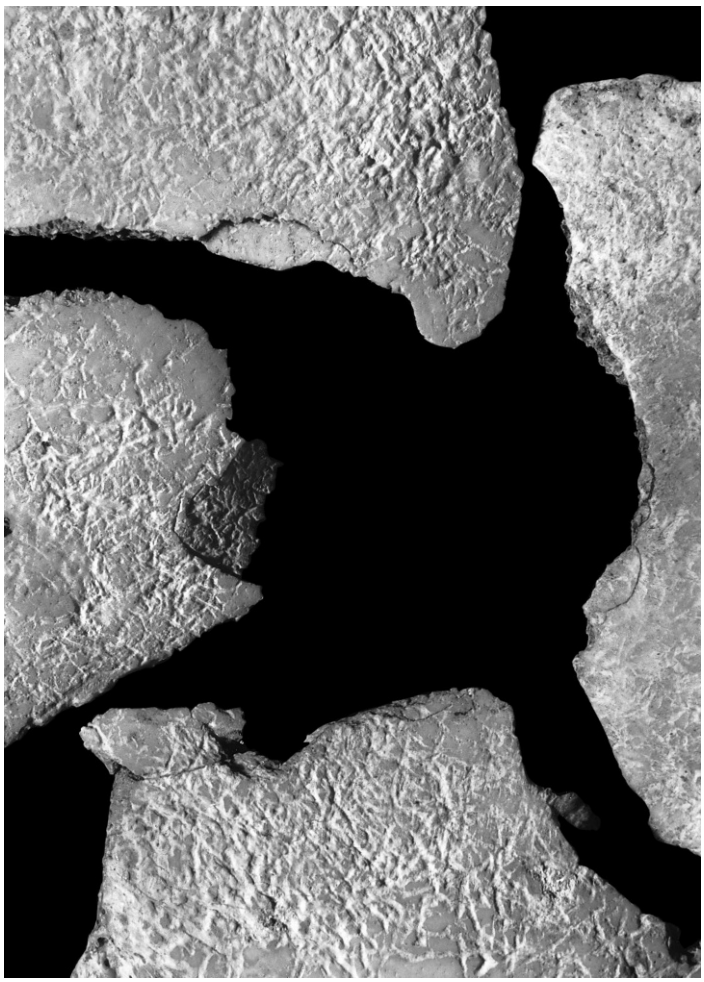

Figure 26.10 **Cranial fragments from the Cottonwood sample that show evidence of hammerstone percussion**. Note also the extensive root etching of the outer bone surface. Magnification 2×.

Figure 26.11 **Cut marks made by a stone tool on a long bone shaft fragment**. Magnification 4×.

The fragmentation in the assemblage and the data from conjoining studies indicate that there was extensive perimortem human involvement with the bone material. This involvement included skinning, flesh removal, or disarticulation activities indicated by cut marks. Burning was difficult to assess, but some bone fragments were heated to very high temperature after fracture. Fracture of the vault and limb bone shafts was accomplished by percussion with a hammerstone, resulting in anvil scars, adhering flakes, and crushing. The lack of spongy bone parts of elements suggests that these portions of the bone were also crushed by hammerstone impact.

The composition and characteristics of the fragmented human bone assemblage from Cottonwood Wash site 42SA12209 are similar to what is seen in a variety of sites across the Southwest. These assemblages have been interpreted as evidence of cannibalism (White, 1992). It will be necessary to address patterns within and variation between these assemblages of human bone from the prehistoric Southwest before we are in a position to understand their full behavioral significance. This endeavor will necessarily involve the combined skills of the archaeologist and the human osteologist if progress in understanding cannibalism is to be made.